

6. SUMMARY AND CONCLUSIONS

To summarize, we can state the following:

1. Measurement of water vapor in the upper troposphere and lower stratosphere is important for modeling the global climate.
2. Existing data are extremely sparse.
3. The ARES infrared instrumentation provides a unique resource for measuring upper tropospheric water vapor.
4. Analysis of the ARES May 1994 measurements show the quality of the data and indicate a variance with sonde measurements.

As for the future work, we have considered what needs to be accomplished. A more complete analysis of the data sets from the 31 May 1994, 25 August 1994, and 14 December 1994 ARES missions, is needed to refine the analytical tools that will be needed to reduce the data obtained from the additional missions. The key issues that should be addressed are the following:

1. The nonlinear relationship between the strength of the absorption in the $\sim 5.8 - 6.2 \mu\text{m}$ water band and the column density of overlying water vapor, especially at the lower altitudes, complicates the analysis and necessitates the use of an interactive procedure. We should determine whether our present data reduction techniques can be modified to take this nonlinearity into account in a manner that will significantly reduce the requisite amount of computer time.
2. We would investigate whether a sufficiently accurate determination of water vapor densities will call for us to base our analysis on FASCOD^[10], which utilizes a far more detailed treatment of individual spectral lines than does MODTRAN but also requires significantly more computer time to execute.
3. We also need to determine whether, in measuring water vapor column densities, it is necessary to account for attenuation of radiation by condensed water or other aerosols at the altitudes and infrared wavelengths of interest.
4. We would investigate whether there are any unforeseen difficulties in extracting quantitative information on night time water vapor concentrations of accuracy and reliability comparable to that derived from data obtained in daylight missions.